EXP-32
February 6, 1973

ACCELERATOR EXPERIMENT--Further Measurements of Booster Beam Decay

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Date Performed:

Earlier measurements of booster beam decay during the first 2 milliseconds of the booster cycle were reported by Gray at the January 24 staff meeting (see notes of that meeting by Snowdon). All these measurements were made with ac magnetic field and rf on. The measurements reported here vary field and rf conditions.

DATA

Figure A compares decay rates with ac and dc magnetic field, with rf on in the ac case and off in the dc case. Time scale is 5 msec/div.

Figure B compares rf on and rf off with ac magnetic field in both cases. Time scale is 0.1 msec/div.

Figure C shows the same comparisons with a time scale of 0.5 msec/div.

In all the above cases, sextupoles were on with the usual operating value of 25A. In Figure D, we compare decay rates with sextupole currents of 0, 15, 25, and 40A. Time scale is 5 msec/div. Figure E is the same comparison with a time scale of 0.5 msec/div. Both D and E have dc magnetic fields and rf off.

CONCLUSIONS

(i) The decay rate is much slower with dc magnetic field.

(ii) The decay rate is not affected by rf in the 500 μsec before beam has spiralled in.

(iii) The overall decay is least at the usual operating value of sextupole current. Too little sextupole causes loss beyond 5 msec. Too much causes loss during the first 2 msec.

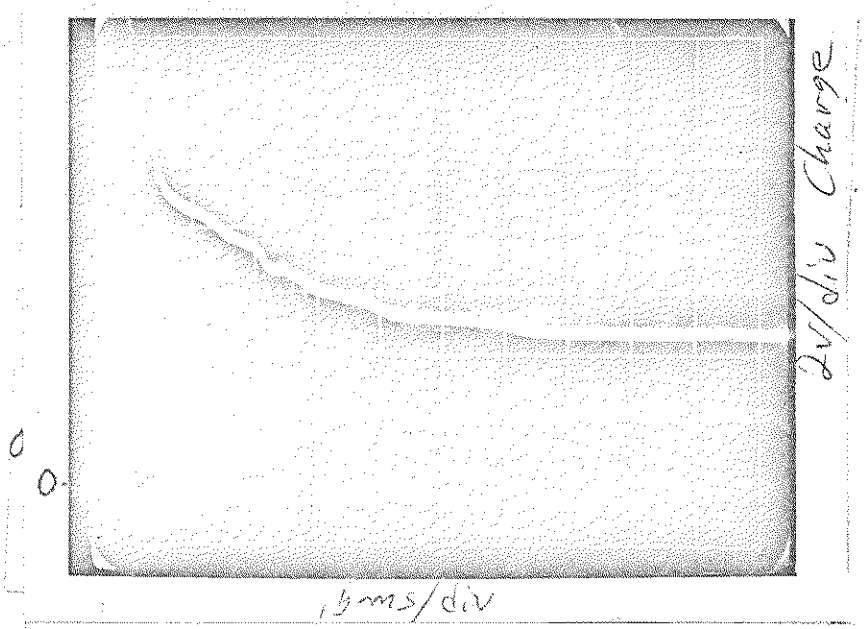
POSSIBILITIES

(i) The beam decay may be caused by some problem with ac magnetic fields that does not exist with dc fields.

(ii) The loss after 500 μsec is believed to be transverse. It may be caused by crossing a resonance or by interaction with the synchrotron motion.

E. L. Hubbard

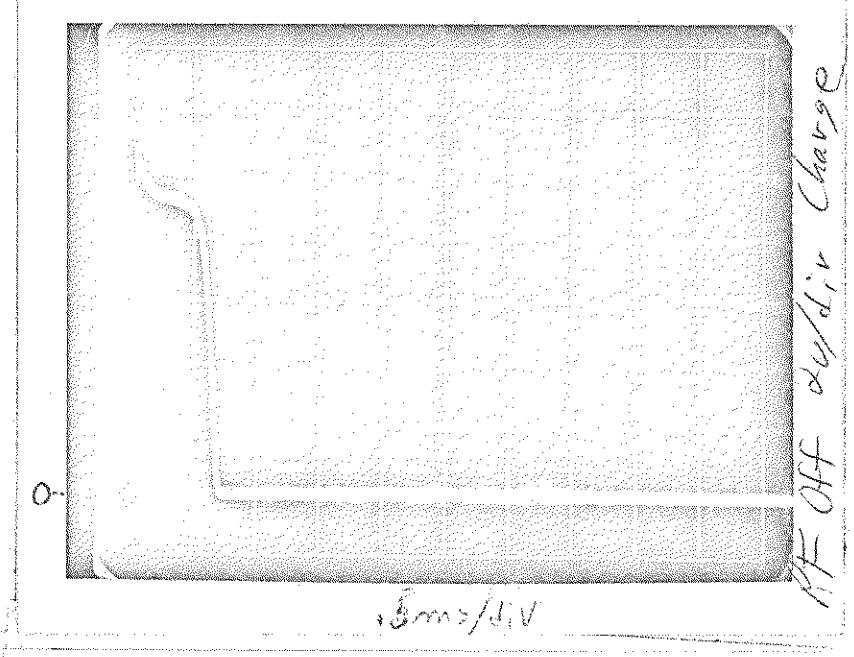
(A)
8 GeV
vs
dc Mag
Left 25
5 msec/div
RF on 2v/cm Charge
5ms/div
(B)
AC
Magnet
RF on
vs
RF off
RF OFF 2v/div Charge
0.1ms/div
RF off
RF ON 2v/div Charge
.1ms/div
RF on



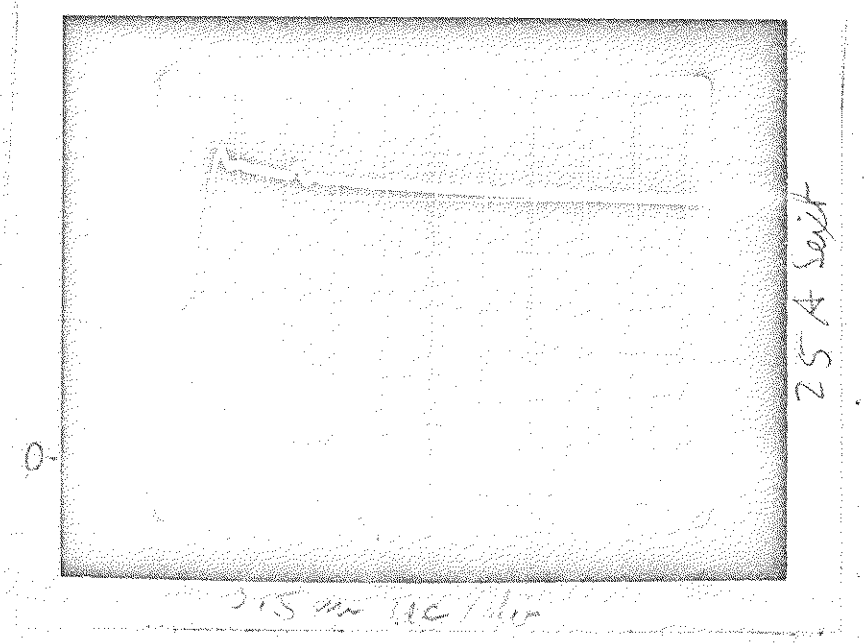
acceleration to 8GeV

(C)

First 5 msec



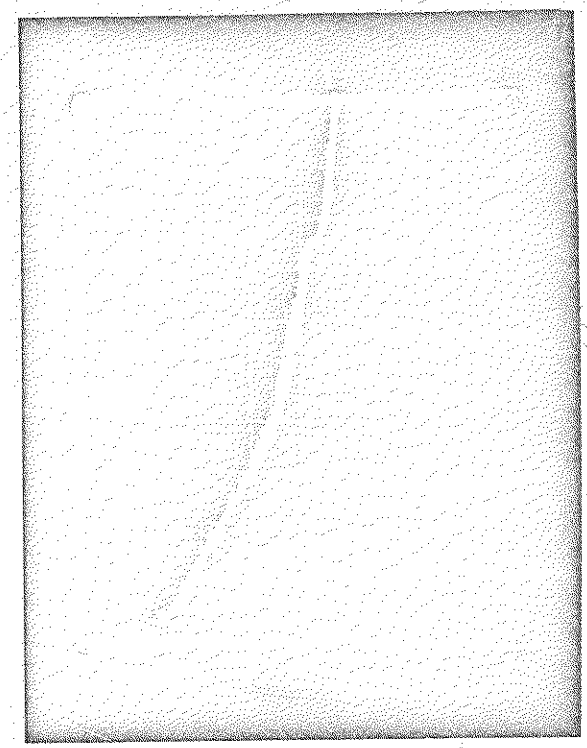
AC Magnet RF off

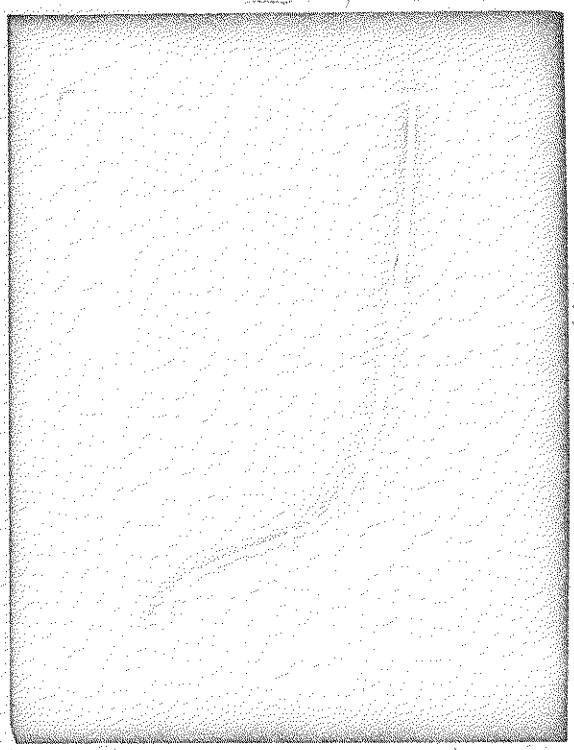


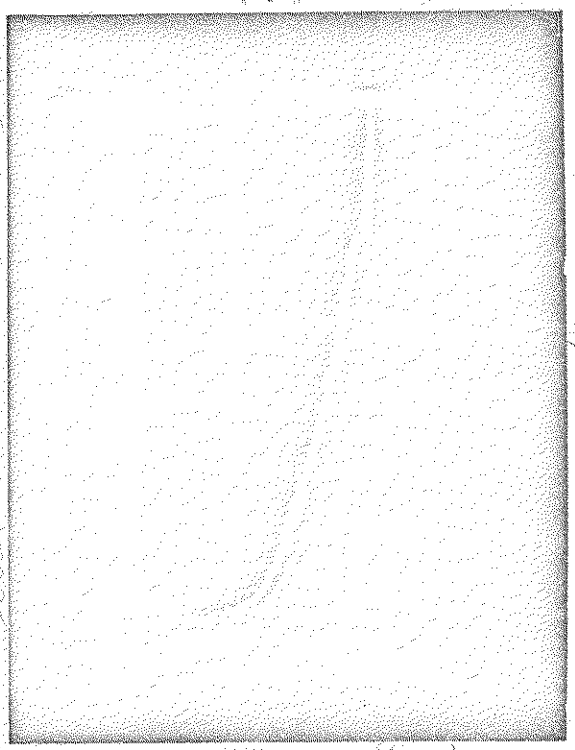
DC Magnet

(D)

(D) Effect of Sensitive Current







(E) Effect of Septum plate current on DC Magnet